New Brunswick Heart Health Survey Report

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Health and Community Services
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and
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NEW BRUNSWICK HEART HEALTH SURVEY REPORT

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HEALTH AND COMMUNITY SERVICES

NEW BRUNSWICK

AND

HEALTH AND WELFARE CANADA

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PREFACE

The New Brunswick Heart Health Survey was carried out in 1988 by the Public Health and Medical Services Division of the Department of Health and Community Services, Government of New Brunswick in collaboration with the Department of National Health and Welfare.

The Principal Investigator for the survey was Dr. Christofer Balram, Provincial Epidemiologist and Director of Health Promotion and Disease Prevention.

This report is intended to provide an overview of the main findings of the survey. The results should serve as a basis for discussion at the provincial and national level leading to the development and implementation of strategies and programs to address this major public health issue.

The survey methodology, the results and the conclusions were reviewed by a Data Interpretation Committee to whom special thanks are due. The composition of the Committee was as follows:

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Thanks are due to the public health nurses and District Medical Health Officers of the Regional Public Health Units as well as to the Provincial Coordinator (Appendix II). Thanks are also due to the Regional Hospital Laboratories whose staff assisted in the processing of the blood samples and to staff in the Medicare Branch of the Department of Health and Community Services who provided assistance in developing computerized listings of the sampling frame. The cooperation of New Brunswickers who participated in this survey is also gratefully acknowledged.

The assistance of staff at the Computer Centre at Memorial University of Newfoundland, especially to Ms. Alison Edwards and Mr. Mukund Nargundkar of the Special Surveys Division, Statistics Canada, and Dr. Philip Connelly from the Core Lipid Laboratory, University of Toronto is gratefully appreciated.

Special thanks are also due to Dr. David MacLean, Principal Investigator of the Nova Scotia Heart Health Survey, who kindly shared the protocol used in that study and to Dr. Andres Petrasovits of the Health Promotion Directorate of Health and Welfare Canada for his generous support and encouragement.

INTRODUCTION

In Canada, as in most industrialized countries, non-communicable chronic diseases are the leading cause of premature death and disability. Mortality from cardiovascular disease accounts for about 43% of all deaths (Statistics Canada, 1986).

New Brunswick experiences higher-than-average death rates from cardiovascular disease than other Canadian provinces. For the period 1985-87, the age-adjusted mortality rates for total cardiovascular disease in New Brunswick for males (females) were 7% (3%) above the national average (Nicholls et al., 1988). Each year more than 1,800 New Brunswickers die from cardiovascular disease, which is the leading cause of deaths in the province (Balram, 1987). A major proportion of hospital care days is also associated with cardiovascular disease morbidity (Balram, 1988).

Although mortality rates for cardiovascular disease and those of its major components, ischemic heart disease and stroke, have declined in all regions of Canada since the 1960's, the Atlantic region has experienced the least decline (Nicholls et al., 1981, 1986).

Epidemiological, clinical and laboratory studies have identified elevated blood cholesterol, smoking and high blood pressure as the main independent risk factors for cardiovascular disease. These risk factors are either preventable or controllable (Kaplan and Stamler, 1983).

The widespread prevalence of these risk factors in Canada has been documented (Department of National Health and Welfare, 1973; Statistics Canada and Department of National Health and Welfare, 1981; Fitness and Amateur Sport Canada, 1983; Nova Scotia Department of Health and Fitness, 1987; Robitaille et al., 1979).

It is being increasingly recognized that, even at moderate elevations, increased blood cholesterol and blood pressure levels account for a large proportion of premature cardiovascular disease mortality and morbidity (Rose, 1981).

The value of a multifactorial, integrated approach to prevention of cardiovascular disease and of non-communicable diseases in general, has been recommended by a number of national and international health policy groups and agencies (Federal Provincial Working Group on the Prevention and Control of Cardiovascular Disease, 1987; World Health Organization 1982,1985,1986; European Atherosclerosis Society, 1987; Resolution of the Thirty-Eight World Health Assembly, 1985)

The purpose of the New Brunswick Heart Health Survey was to estimate the prevalence and distribution patterns of cardiovascular disease risk factors, including high blood pressure, abnormal levels of blood lipids, smoking and co-morbid conditions, e.g. obesity. The survey also addressed some aspects of knowledge and awareness of factors that lead to cardiovascular disease risk, e.g. dietary factors.

The survey was carried out by the Public Health and Medical Services Division of the Department of Health and Community Services, Government of New Brunswick in collaboration with the Health Services and Promotion Branch of the Department of National Health and Welfare. To allow comparability with the data sets of other provinces which are also doing heart health surveys, the study protocol for the New Brunswick Heart Health Survey followed closely the one developed for use in the 1986-87 Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987).

The data processing support was provided by the Atlantic Heart Health Data Processing Centre, established ad hoc in the Division of Community Medicine, Faculty of Medicine, Memorial University of Newfoundland, St. John's, Newfoundland. The statistical sample design was prepared by the Special Survey Methods Division, Statistics Canada. The lipid analyses of blood samples were carried out by the Core Lipid Laboratory, St. Michael's Hospital, Toronto.

A probability sample of 2,098 residents of the province, between ages 18 to 74 was obtained from 22 centers in the province which, for sampling purposes were divided into three strata. Seven of these were urban centers; the remainder were rural counties. The survey field operations were carried out between July and October 1988.

The data were collected by public health nurses and District Medical Health Officers in the Public Health Regions. These data were gathered at a home interview and at a subsequent visit to a survey clinic (Table 1). The survey staff was supervised by Regional Coordinators who were public health nurses. Provincial supervision was provided by a Survey Coordinator and the Principal Investigator. The questionaire from the Nova Scotia Heart Health Survey was modified for use in New Brunswick and then field tested.

In addition to documenting the nature and extent of cardiovascular disease risk in the province, the study demonstrates how the Public Health System, with support of existing resources can effectively carry out epidemiological research which is intrinsic to the establishment of goals, development of public health policy and to the planning and evaluation of intervention programs.

SURVEY RESULTS

Response rate

The survey response rates by age and sex and by stratum are shown in **Tables 2 and 3**. Among the 3,872 individuals who were drawn from the Medicare Registration File for Residents of New Brunswick 71%, or a total of 2,742 were located and invited to participate in the survey. Among these, 77%, or 2,098 completed the whole interview and 71%, or 1,953, completed both the interview and the clinic components of the survey.

The response rates at the interview and clinic levels were roughly similar for the different age-sex groups, except for the younger males (18 to 34 years), where the response was lower (**Table 2**). There was no appreciable difference in the response rates among the three strata (**Table 3**).

The socio-demographic characteristics of the participants are given in **Table 4**. About one in 3 participants had post-secondary education and one in 14 had elementary education up to grade 6. Slightly more than one in 2 participants reported either full-time or part-time employment at the time of the survey.

Blood pressure

The blood pressure results are shown in **Tables 5 to 10**. The mean values for systolic blood pressure increased with age in both sexes and tended to be higher in males than in females in the younger and middle age groups (18 - 34 and 35-64). There was an increase in the mean diastolic blood pressure level from the younger to the middle age groups (**Table 5**).

The prevalence of high blood pressure is also shown in Table 5. In this report, high blood pressure is defined as diastolic blood pressure equal to or greater than 90 mm Hg and/or on treatment, whether pharmacological or non-pharmacological (weight control or salt restriction) for the purpose of lowering blood pressure.

Using the above definition, the overall prevalence of high blood pressure was 19%, equivalent to 93,000 individuals in the population ages 18 to 74. In the younger and middle age groups, the prevalence was higher in males, while in the older age group (ages 65 to 74) the prevalence was higher in females.

High blood pressure awareness, treatment and control status is given in Table 6. The criterion used to define "control" was diastolic blood pressure less than 90 mm Hg. By this criterion, about 60% of individuals with high blood pressure were uncontrolled and one in 5 was unaware of his/her condition. The rate of uncontrolled high blood pressure among the treated group was about 39% [100x26/(41+26)].

The vast majority of individuals (98%) had their blood pressure checked sometime in the past. Over two-thirds had their blood pressure checked within the last year, with apparent lower frequency of measurement in the younger males. Health professionals took virtually all measurements, but less than one in 3 individuals reported that the actual blood pressure level was given in numbers (Table 7).

Among individuals who were ever told by a health professional that they had high blood pressure, two-thirds reported that they had been prescribed some treatment. At the time of the home interview, one in 2 individuals for whom something had been

prescribed was taking drugs, and about one in 3 was not following a treatment regimen (Table 8).

The specific treatment advice, reported to have been given, was primarily drug therapy. The most common non-pharmacological measures, reported having been prescribed, were salt restriction (39%) and weight control (29%) (Table 9).

A majority of individuals appreciated that high blood pressure is related to what people eat and drink. It is worth noting that while 55% recognized salt as a factor, only 2% identified sodium. Alcohol was seen as important by about two in 3 individuals (Table 10)

Lipids

The results of the blood lipids analyses are shown in Tables 11 to 18.

All estimates are based on lipid values for those participants who reported fasting 8 hours or more, which represent 94% of clinic attendees.

Table 11 shows that mean total plasma cholesterol level increased with age. In males, the mean values levelled off with age, whereas in females they continued to rise. Mean HDL-cholesterol level was higher in females than in males for each age-sex group.

Mean LDL-cholesterol values closely paralleled total plasma cholesterol, increasing with age in both sexes, higher in men than in women under age 65 (Table 12).

Mean triglycerides values were higher among males than among females in the younger and middle age groups. The reverse pattern was seen in the older age group (Table 12).

The following cut-off points (Tables 13 to 18) which were used to identify the percentage of the population above or below specified levels of lipid fractions associated with various degrees of risk, are based on criteria suggested by a number of, generally concordant, expert review panels (The Expert Panel: Canadian Consensus Conference on Cholesterol: Final Report, 1988; The Expert Panel: National Cholesterol Education Program 1988; European Atherosclerosis Society, 1987; The British Cardiac Society Working Group on Coronary Prevention, 1987; Consensus Development Conference, 1985)

Table 13 shows that about one-half of the participants, equivalent to 229,000 in the population ages 18 to 74, had total plasma cholesterol levels above the "desirable" value of 5.2 mmol/L (200 mg/dL). This prevalence increased with age and was higher for males than for females in the younger and middle age groups. In the older age group the prevalence was higher among females.

About three in 10 individuals, equivalent to 141,000 in the population ages 18-74, were in the "borderline-high" cholesterol range, i.e. between 5.2 and 6.2 mmol/L (200 to 240 mg/dL).

About one in 5 individuals, equivalent to 88,000 in the population ages 18-74, had total plasma cholesterol levels above 6.2 mmol/L (240 mg/dL), the range recognized as "high blood cholesterol". This prevalence was higher in older females. In the middle age group the prevalence of "high blood cholesterol" was somewhat higher among males.

About 40% of individuals, equivalent to 185,000 in the population ages 18 to 74, had a LDL-cholesterol level above the "desirable" value of 3.4 mmol/L (130 mg/dL) and about one in 7, equivalent to 73,000 in the population ages 18-74, was in the "high risk LDL-cholesterol" range, i.e. above 4.1 mmol/L (160 mg/dL). The distribution of individuals over different ranges of LDL-cholesterol associated with increased coronary heart disease risk, for different age-sex groups, was similar to that noted above for plasma cholesterol (Table 14).

About one in 12 individuals, equivalent to 39,000 in the population ages 18 to 74, had a HDL-cholesterol under 0.9 mmol/L (35 mg/dL), a level which has been recognized as a major risk factor for coronary heart disease. This prevalence of "low HDL-cholesterol" was higher in males than in females in all the age-sex groups especially among older males (26%) (Table 15).

The distribution of individuals, with all age-sex groups combined, by various levels of LDL-cholesterol and HDL-cholesterol is shown in Table 16. Forty-three percent (43%=100%-57%) of individuals had a LDL or a HDL-cholesterol level above the desirable levels for those two lipoprotein fractions (LDL-cholesterol equal to or greater than 3.4 mmol/L (130 mg/dL) or HDL-cholesterol less than 0.9 mmol/L (35 mg/dL)). About one in 5 (22%=100%-57%-21%)individuals was at an increased risk of coronary heart disease either due to low HDL-cholesterol, high LDL-cholesterol, or both.

Table 17 shows the distribution of individuals, with all the age-sex groups combined, over various levels of total plasma cholesterol and LDL-cholesterol. Among individuals who were in the "borderline-high" plasma cholesterol range, one in 14 (2/28) was also in the "high risk LDL-cholesterol" group. However, those in the "high risk cholesterol" range, about three in 4 (13/17) also had in the "high risk LDL-cholesterol" category.

Table 18 shows the distribution of individuals, with all age-sex groups combined, over various levels of total plasma cholesterol and HDL-cholesterol. Among individuals within the "desirable" range with respect to total plasma cholesterol, one in 18 (3/53) had a low HDL-cholesterol.

Knowledge and awareness data on cholesterol are given in Tables 19 to 23 with all age-sex groups combined.

Most individuals had heard about cholesterol (95%) and among these, one in 3 said he/she had it measured. Two-fifths of these individuals reported that they were told their blood cholesterol level. Among those who had heard about cholesterol, one in 9 was told that his/her cholesterol level was high. A large majority of individuals (83%) had some treatment prescribed or advice given and in two out of 5 cases, dietary measures were recommended (Table 19).

Among those who had heard about cholesterol, a large majority of them (92%) were aware that cholesterol is found in foods and, among these, most believe (97%) that it can affect health. About 60% of individuals believed that cholesterol is found in eggs and one in 2 recognized that it is present in pork and beef. About one in 4 realized that cholesterol is also found in whole milk and cheese (Table 20).

The presence of cholesterol in the blood was recognized by a large percentage of individuals (82%) who reported having heard about cholesterol. Among those aware of its presence in the blood, virtually everyone (99%) was aware that blood cholesterol affects health; two-thirds knew of its relationship to heart attacks (Table 21).

Among those who had heard about cholesterol, when asked what measures an individual may take to lower his or her cholesterol level, about one in 2 said reduction of fatty foods or foods with less cholesterol. Less than one in 10 recognized the value of low fat dairy products and of weight reduction (Table 22).

On a related issue, fat consumption was viewed by a large majority of individuals (91%) as affecting health. However, less than 50% of these individuals recognized the relationship between fat consumption and heart disease and to risk factors for heart disease such as elevated blood cholesterol and overweight (Table 23).

Smoking

The prevalence of regular cigarette smoking was 31%, equivalent to 151,000 individuals in the population ages 18 to 74. The prevalence was higher among males and females in the younger and middle age groups. The highest rate, 40%, was among males 18-34 years of age (Table 24).

Among regular cigarette smokers, about one in 7 was a heavy smoker (over 25 cigarettes per day). The prevalence of heavy smoking was highest for middle age males and was considerably higher among males than females for each age group (Table 25).

Alcohol consumption

The percent distribution of alcohol consumption shows that, on the average, about one in 3 individuals had seven or more drinks per week and that one in 7 had 20 or more drinks per week. Males reported drinking more than females in all age-sex groups. In both sexes, the prevalence of heavier drinking was highest in the younger age group and declined with age (Table 26).

Weight

The Body Mass Index (BMI) is recognized as an appropriate indicator to categorize the weight of individuals with respect to possible health risks (Bray, 1985). The mean values of BMI by age-sex groups and the frequency distributions according to BMI levels are given in Table 27. Higher mean BMI values were observed in middle age and older males and in older females.

Using the Canadian Guidelines for Healthy Weights (Department of National Health and Welfare, 1988), about one in 3 individuals in the population ages 18 to 74 had a weight which for height is associated with excess mortality and morbidity from a variety of chronic diseases (BMI equal to or greater than 27). This prevalence was higher among middle age and older males and in older females.

About one in 6 individuals in the normal weight category (BMI under 25) was trying to lose weight. This was much more common among females in the younger and middle age groups. Among overweight individuals, that is those with BMI over 27, generally less than one in 2 was trying to lose weight. This was more common among females than among males (Table 28).

Overall, slightly more than one in 4 individuals, ages 18 to 74, were trying to lose weight. Dieting was the most common method used to lose weight (85%) followed by exercise (57%). Use of diet pills for weight loss was minimal (1%) (Table 29).

Diabetes

Five percent of individuals, equivalent to 24,000 in the population ages 18 to 74, reported ever been told that they have diabetes. Among the 101 individuals in the sample who were aware, 23 reported having been diagnosed at age 30 or younger (Table 30).

Physical activity

Slightly over one-half of the individuals exercised at least once per week. Among these, about two in 5 reported that the exercise was strenuous enough to cause sweating or breathing heavily and for about 60% the duration of the exercise was in excess of 30 minutes. Younger females exercised more often than younger males, whereas older females exercised less often than males. Females exercised less strenuously than males and the length of their exercise period was of less duration, for each age-sex category (Table 31).

Combined risk factors for cardiovascular disease

Table 32 gives the percentage of the population with 0,1,2, or 3 of the major risk factors for cardiovascular disease: smoking, high blood pressure and elevated blood cholesterol. Two in 3 individuals, equivalent to 331,000 in the population ages 18 to 74, had one or more major risk factors. This prevalence of combined risk factors increased with age and was higher among males than among females in the younger and middle age groups.

One in 4 individuals had two or more of the major risk factors, equivalent to 122,000 individuals in the population ages 18 to 74. This prevalence of combined risk factors increased substantially between the younger and the middle age groups for both sexes. While in the younger and middle age group this prevalence was higher among males than among females, the opposite was true in the older age group.

Information on awareness of the causal risk factors in the development of heart disease is given in Table 33. About four in 10 individuals recognized smoking as a risk factor for heart disease. About one in 3 identified overweight or poor diet, and three in 10 high blood cholesterol or high blood pressure. Stress and lack of exercise were reported as causes by 38% and 31% of individuals, respectively.

DISCUSSION OF RESULTS

Survey response

The overall location rate for individuals whose names were drawn from the Medicare Registration File for Residents of New Brunswick was less than anticipated, but higher than the one obtained in the Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987). This is explained by the fact that the Medicare Registration File for Residents of New Brunswick was not fully updated at the time of the survey. Some individuals had moved from their registered address. Others had died or left the province and may not have been deleted from the File.

However, since virtually all residents in the province are registered, every resident 18 to 74 years of age had some probability of selection under the sampling scheme used. The probability weights were not adjusted for double listings, nevertheless, this is not believed to have an appreciable effect on the tabular estimates.

The overall response rate for the survey and the response patterns by age-sex groups compare favorably with those observed in national and international studies (Department of National Health and Welfare, 1973; Statistics Canada and Department of National Health and Welfare, 1981; Nova Scotia Department of Health and Fitness, 1987; The WHO-MONICA Project,1988). This was largely due to the fact that the community health professionals who conducted the survey enjoyed a high degree of credibility and trust in the community.

To assess the extent to which non-response may have influenced the results, a comparison is made in Table 34 of selected socio-demographic characteristics and health behaviours between clinic attendees and those individuals who participated in the home interview, but did not come to the clinic. This Table shows that those who did not attend the clinic were more likely to be regular cigarette smokers and fewer of them had post-secondary education. There were no appreciable differences between the two groups with respect to the prevalence of high blood pressure, sedentary lifestyle and level of income.

The difference observed between these two groups with respect to smoking prevalence and educational level, confirms a similar observation reported by the Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987). Thus, it seems plausible to assume that individuals who did not attend the clinic are more likely to have cardiovascular disease risk factors. For this reason, the prevalence estimates reported here may, in fact, be underestimates of the actual prevalence of risk factors in the population.

<u>High blood pressure</u>

In this survey, the presence of high blood pressure was defined as follows: (1) a diastolic blood pressure equal to or greater than 90 mm Hg (the mean of four measurements made at two separate visits) and/or (2) being on medication and/or salt restriction and/or weight reduction for the treatment of high blood pressure.

It is worth pointing out that the New Brunswick Heart Health Survey provides more reliable prevalence rates of high blood pressure than other surveys where blood pressure was measured at one visit only (Department of National Health and Welfare, 1973,1989; Statistics Canada and Department of National Health and Welfare, 1981; Fitness and Amateur Sport Canada, 1983).

From a clinical perspective a diastolic blood pressure reading falling into the lower end of the range of "90 mm Hg and over" does not necessarily imply that an individual would be labeled hypertensive or that drug treatment is indicated. However, longitudinal studies have shown that blood pressure measurement on only one occasion can predict the occurrence of high blood pressure (Rabkin et al., 1982; Robitaille et al.,1983), cardiovascular disease (The Pooling Project Research Group, 1978) and death from any cause (Johansen et al., 1987) years later.

Thus, the criteria used in this report to define high blood pressure are judged to be appropriate to determine the health of the community in that they provide a measure of the increased cardiovascular disease risk due to elevated blood pressure (Blackburn et al., 1985; Nova Scotia Department of Health and Fitness, 1987; Department of National Health and Welfare, 1989).

The prevalence of high blood pressure in New Brunswick is similar to that reported in the Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987) and in the Canadian Blood Pressure Survey (Department of National Health and Welfare, 1989).

The prevalence of high blood pressure was higher in the older age group, where issues of compliance as well as the risks and benefits of treatment are still uncertain (Larochelle et al., 1986). Although the prevalence in the younger age group was much lower, it is worth noting the non-compliance with treatment was likely to be more of a problem than with some other age groups.

It is of concern that among individuals with high blood pressure, 59% were not controlled and that one in 5 was unaware of his/her condition. This was so despite the fact that 71% of the participants had their blood pressure checked within the year prior to the survey.

These findings suggest that the management and/or compliance with prescribed therapy is far from optimal. This is supported by the finding that, among individuals who were told that they had high blood pressure and were prescribed a treatment or program, an appreciable proportion of them was not following the treatment or program at the time of the survey.

Factors which may be associated with the lack of control of high blood pressure appear to be the inappropriate information given to patients concerning their blood pressure and the relative infrequent use of non-pharmacological approaches to management of the condition.

Lipids

According to recent scientific consensus conferences, the presence of high levels of total blood cholesterol and LDL-cholesterol, as well as a low HDL-cholesterol level and a high ratio of total cholesterol to HDL-cholesterol are strongly related to the development of atherosclerosis in humans and therefore warrant remedial action (The Expert Panel: Canadian Consensus Conference on Cholesterol:Final Report, 1988; The Expert Panel: National Cholesterol Education Program 1988; European Atherosclerosis Society, 1987; The British Cardiac Society Working Group on Coronary Prevention, 1987; Consensus Development Conference, 1985). The data from the New Brunswick Heart Health Survey permit an assessment of the population risk in terms of these different plasma lipid fractions and their combinations.

The Canadian Consensus Conference on Cholesterol (1988) recommended as a goal a mean total blood cholesterol level of 4.9 mmol/L (190 mg/dL) in the general population. By this criterion, the data from the New Brunswick Heart Health Survey indicate that, for middle age and older groups, a reduction of about 10% in the mean blood cholesterol level from current levels would apply.

MacMahon and Peto (1988) have estimated, from a review of intervention trials, that such a reduction in the mean blood cholesterol level (10%) should result in a reduction of between 10 to 30% in total coronary heart disease. The feasibility of achieving this goal in Canada has been examined by Little and Horlick (1989) who conclude that the estimated reduction in coronary heart disease would be even greater, particularly if accompanied by the reduction and control of other risk factors such as smoking and high blood pressure.

LDL-cholesterol is recognized as the major atherogenic fraction (Grundy, 1986; Brown and Goldstein, 1986). However, for purposes of case-finding and initial evaluation in practical settings, analysis of total blood cholesterol is more readily available. The latter is a good proxy for risk since total blood cholesterol is closely correlated with LDL-cholesterol by virtue of the fact that about 70% of the cholesterol in the plasma is found in LDL-cholesterol.

There are an estimated 229,000 New Brunswickers who are at increased risk due to elevated plasma cholesterol (above 5.2 mmol/L (200 mg/dL)) who would likely benefit from having it reduced. Among these, 88,000 are at high risk [above 6.2 mmol/L (240 mg/dL)] and probably require some form of medical intervention.

The overall prevalence of elevated plasma cholesterol, LDL-cholesterol and low HDL-cholesterol over various levels of risk reported here, matches very closely that observed in the Nova Scotia Heart Health Survey (MacLean and Petrasovits, 1988).

Clinical trials have shown that lowering LDL-cholesterol in men with high levels decreases the incidence of coronary heart disease (Mishkel, 1989; Langille and Lavigne, 1988). In terms of this fraction, 185,000 individuals in the population, ages 18 to 74, may be considered to be above "desirable" levels [equal to or greater than 3.4 mmol/L (130 mg/dL)] and 73,000 are probably in the "high risk LDL-cholesterol" range [equal to or greater than 4.1 mmol/L (160 mg/dL)].

A low HDL-cholesterol concentration, defined as a level below 0.9 mmol/L (35 mg/dL)) is associated with a significant increase in coronary heart disease risk in both men and women (Gordon et al. 1977; Goldburt and Medalie, 1979). Hygienic means (e.g. smoking cessation, aerobic exercise, weight control) have been recommended to raise "low HDL-cholesterol" levels; however, drug therapy specifically to raise HDL-cholesterol in patients without high blood cholesterol levels is not advocated (Grundy et al., 1989). By this criterion there are about 39,000 individuals in the province at risk due to "low HDL-cholesterol".

The higher prevalence among middle age men of risk levels for total plasma cholesterol and the lipoprotein fractions LDL and HDL-cholesterol, together with evidence from epidemiological intervention studies and recommendations from review panels, suggest that they would constitute a priority for intervention (The Expert Panel: Report of the National Cholesterol Education Program, 1988; Toronto Working Group on Cholesterol Policy, 1989).

The statistical cross-tabulations of prevalence for different lipid fractions (Tables 17 and 18) have implications for the definition of practical guidelines for detection and evaluation of abnormal lipid patterns after a total plasma cholesterol value has been obtained. In particular, the data allow an assessment of the value of determining the LDL and HDL-cholesterol following determination of total plasma cholesterol.

In evaluating the usefulness of measuring LDL and HDL-cholesterol in individuals who were found to have a high risk total cholesterol, that is greater than 6.2 mmol/L (240 mg/dL), note that 95% (16/17) of individuals in this group had an elevated LDL-cholesterol [above 3.4 mmol/L (130 mg/dL)] and 6% (1/18) also had a low HDL-cholesterol [less than 0.9 mmol/L (35 mg/dL]. Therefore, there appears to be little benefit to be gained by measuring LDL and HDL-cholesterol in these individuals (**Tables 17 and 18**).

However, in the medium risk range for total plasma cholesterol (between 5.2 and 6.2 mmol/L [200 mg/dL to 240 mg/dL)], 31% (9/29) of individuals had a normal LDL-cholesterol [less than 3.4 mmol/L (130 mg/dL)] and 86% (25/29) had HDL-cholesterol greater than 0.9 mmol/L (35 mg/dL). This suggests that, among these individuals, it is worth measuring LDL and HDL-cholesterol as a means of avoiding their entry into a treatment program (**Tables 17 and 18**).

Among individuals with a "normal" total plasma cholesterol level of less than 5.2 mmol/L (200 mg/dL), about 4% (2/55) had an above normal LDL-cholesterol [greater than or equal to 3.4 mmol/L (130 mg/dL)] and about 6% (3/53) had a high risk HDL-cholesterol [less than 0.9 mmol/L (35 mg/dL)]. This would indicate some benefit of measuring LDL-cholesterol and HDL-cholesterol in this group of individuals with normal total plasma cholesterol, particularly when other risk factors are present(**Tables 17 and 18**).

If the results of studies conducted in the United States are a guide to the Canadian situation, bringing about control of individuals at high risk from elevated blood cholesterol will require addressing the lack of awareness on the part of physicians of the importance of elevated blood cholesterol as a risk factor, and the apparent lack of action to manage it at levels associated with moderate risk (Shucker et al.,1987a, 1987b).

Most individuals are aware of the existence of cholesterol and that it may have an impact on health. However, specific knowledge of its link to diet and specific health outcomes is lacking. Although there are many factors which can influence blood cholesterol, in most individuals with moderate elevations, diet is the most overriding one (Blackburn, 1979). This would suggest the need for public education programs which speak directly to the need to reduce total and saturated fat intake, as well as practical guidance for individuals on how to achieve it.

According to current consensus guidelines, large numbers of individuals are implicated as being at increased risk for cardiovascular disease. Recent estimates prepared by the U.S. National Center for Health Statistics indicate that, using the National Education Cholesterol Program guidelines for Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (The Expert Panel, 1988) about 40 million Americans between the ages of 20 and 59 years are candidates for medical advice and intervention (Sempos et al., 1989).

The definition of priority high risk groups for case-finding, evaluation and treatment is a much debated health policy issue. There is a growing and justified concern that identification of large numbers of individuals as being at risk, coupled with availability of new therapies and the lack of reliability of routine laboratory lipid measurements, could lead to overmedicalization and add to the health care costs without yielding significant benefit to the improvement of the health status of the population (Toronto Working Group on Cholesterol Policy, 1989). Care is needed to avoid the potential harmful consequences of labeling individuals at risk or causing undue anxiety through inappropriate programs of public information or of detection of persons at high risk (Haynes et al., 1978; Wagner et al., 1984).

Undue medicalization may, in part, be averted through appropriate professional and patient education programs, cautious treatment guidelines for the use of drugs and by health professionals making more use, when appropriate, of non-pharmacological approaches as sole or adjuvant means to control risk factors such as elevated blood pressure and high blood cholesterol (Canadian Consensus Conference on Non-Pharmacological Approaches to the Management of High Blood Pressure, 1989; The Expert Panel: Canadian Consensus Conference on Cholesterol: Final Report, 1988; Little and Horlick, 1989).

In addressing the above concerns, it is important to keep in perspective that the identification of a large segment of the population as being at risk need not, per se, result in undue impact on health care costs, since for the majority of these individuals, little more would be required than reinforcing the hygienic, general population health promotion-type of approach focusing on appropriate lifestyle changes. (European Atherosclerosis Society, 1987).

Smoking

Due to its widespread prevalence, smoking makes a major contribution to cardiovascular disease mortality and morbidity as well as to other chronic diseases (e.g. lung cancer, chronic obstructive pulmonary disease).

Overall, the smoking rate in New Brunswick is slightly higher than the national average (Department of National Health and Welfare, 1988). It is of special significance to note the high prevalence of smoking among males and females in the younger age group. Among regular smokers it is also worth noting the high prevalence of heavy smoking among middle age males and females. Clearly there is a need for effective programs to prevent smoking and to promote smoking cessation.

Alcohol

Alcohol is being increasingly recognized as a significant factor for high blood pressure, even at moderate levels of consumption (Beilin, Puddey, Vandongen, 1987). Although the reliability of estimating alcohol consumption through interviews may be open to question, the data from this survey suggest that a sizeable proportion of individuals are consuming alcohol at a level that is not consistent with good cardiovascular health.

Weight

There is some controversy as to whether overweight is an independent risk factor for coronary heart disease. However, its role in the expression of high blood pressure, diabetes, hypercholesterolemia and in the development of other chronic conditions, such as osteoarthritis, is well recognized (Bray, 1985; Roncary, 1983). There is evidence that overweight as a risk factor is more significant the earlier in life it occurs (Rabkin, 1977).

The prevalence of overweight in New Brunswick is widespread, especially among middle age and older males and females. Clearly females are more conscious about weight control than males. It is of particular concern that, among young and middle age females, who were of normal weight, over 25% were trying to lose weight. Males are less concerned with weight control as evidenced by the fact that less than 40% of those who were obese were trying to control their weight. This suggests the need to make the public aware of what constitutes a healthy weight without creating undue anxiety (Department of National Health and Welfare, 1988).

With respect to measures currently used to lose weight, it is advisable for education programs to emphasize appropriate dietary habits (e.g. not skipping meals) and the value of exercise. Weight control programs do not seem to be utilized to any great extent. This suggests the possibility of exploring opportunities for self-help and mutual aid groups to assist individuals to understand what a healthy weight is and how to obtain it.

Diabetes

Diabetes is recognized as an independent risk factor for heart disease and is especially significant for women after middle age (Kannel and McGee, 1979). The prevalence of awareness of this condition in this survey is similar to that reported in another study (Statistics Canada and Department of National Health and Welfare, 1981). It is believed that there is a sizeable group of diabetics who are not aware of their condition (Wigle, 1986). The prevalence of diabetes reported here may be an underestimate of the true prevalence.

The small number of individuals in the sample who were aware of their diabetic status does not lend itself to a breakdown by age and gender. Since the prevalence of awareness increases with age, thus it can be presumed that awareness and control programs targeting the middle age and older age groups should be a priority.

Physical activity

There is evidence that vigorous physical activity is a preventive factor for heart disease (Paffenbarger et al., 1978). Exercise helps to control other risk factors (e.g. weight) and it can be beneficial for overall health.

The interview instrument used in this survey did not allow the estimation of the percentage of individuals who exercise vigorously, that is in a manner that would benefit their cardiovascular health. However, the data provide a valid estimate of the proportion of the population which is sedentary and that would benefit from appropriate health promotion activities.

A large segment of the population in New Brunswick leads a sedentary lifestyle. This is consistent with data from the Canadian Fitness Survey (Stephens et al., 1986). Programs which incorporate measures aimed at increasing the physical activity of New Brunswickers are warranted. Approaches appropriately designed for females in the younger and middle age groups should be considered.

Combined risk factors

It is well recognized that significant elevation of anyone of the major cardiovascular disease risk factors can pose a risk to health. For example, the risk of heart attack within a seven year period for middle age men with a plasma cholesterol of 6.2 mmol/L (240 mg/dL) is doubled, in comparison to the risk for middle age men with plasma cholesterol of 5.2 mmol/L (200 mg/dL). However, it is less well appreciated that combined, moderate elevations of several risk factors may also confer a significant increase of coronary heart disease risk. For example, cigarette smoking about doubles the risk of heart disease at all levels of plasma cholesterol (Stamler, 1986).

In New Brunswick, it is estimated that over 331,000 individuals have one or more of the major cardiovascular disease risk factors. This is generally consistent with the estimates obtained in other risk factor surveys where the combined prevalence of risk factors was calculated (Department of National Health and Welfare, 1988). It is worth noting, however, that the combined risk factor prevalence in New Brunswick is lower than that reported in the Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987).

These findings clearly indicate that cardiovascular disease risk is widespread in the population. The survey data also point to important gaps in public knowledge and awareness. Thus, these results would suggest that a multifactorial, integrated health promotion approach is required.

CONCLUSIONS

The data from the New Brunswick Heart Health Survey raise a wide range of issues that need to be addressed. The widespread prevalence of risk factors for cardiovascular disease strongly suggests that the high rate of heart disease and stroke in the province is due, in a large measure, to unhealthy lifestyle characteristics. Consequently, any strategy implemented to address the issue of prevention should target the population at large, dealing with all the major risk factors involved and utilize a broad array of approaches.

The potential impact on health care costs of providing medical interventions to the large number of individuals with elevated blood cholesterol levels should stimulate the development of effective population approaches. The goal of these should be to reduce blood cholesterol levels of most New Brunswickers in a context that addresses other cardiovascular risk factors.

Of paramount importance is the need for an effective dietary strategy to implement the existing Nutrition Recommendations for Canadians (Department of National Health and Welfare, 1977; Beare-Rogers, 1984) and the revised version that is in the process of being prepared by the Department of National Health and Welfare (Beare-Rogers, Personal Communication). Overweight is also a related issue that requires attention in the context of a dietary strategy for enhancing heart health.

Judicious planning, implementation and evaluation of programs to address these dietary issues, requires a valid data base on the nutritional practices and status of the population. The Nutrition Canada Survey was carried out in 1972. There is a need for more current data.

Many residents of the province are at high enough risk for one or more major risk factors and would benefit from medical intervention. The data presented here indicate that the identification and the management of individuals are far from optimal. This is the case with respect to the large number of individuals with uncontrolled high blood pressure, highly elevated blood cholesterol or with multiple risk factors. There is an opportunity for increased use of non-pharmacological approaches to the management of individuals at risk.

There is a need for an organized, systematic approach to enhance the preventive practices of health professionals. This would include cooperative, interdisciplinary programs to enable prevention through primary care practice, as well as approaches to link the primary care sector with the public health system and health promotion community initiatives.

It follows from the above that a comprehensive strategy to address cardiovascular disease prevention in New Brunswick, requires a balanced, two-pronged approach. On the one hand, comprehensive, multifactorial programs targeted to the population at large are clearly indicated since most residents of the province are at some risk. On the other hand, there is the additional requirement to detect and provide medical intervention for the smaller proportion of the population that are at high risk.

The data from the New Brunswick Heart Health Survey may be used to further characterize groups at risk and determine cost-effective approaches of alternative interventions. A key priority is the analysis of the data by socio-economic status, in view of the fact that cardiovascular disease (Wigle and Mao, 1980) and its attendant risk factors (Millar and Wigle, 1986) are known to cluster in disadvantaged groups.

It is clear that comprehensive public health measures are required to implement the above strategies. Emphasis on intersectoral coordination and coalition building between government, professional associations, community health agencies, business and industry and researchers is of the essence to bring about healthy policies and environmental change necessary to deal with the underlying roots of cardiovascular disease in this province.

TABLE 1

DATA GATHERED AT THE HOME INTERVIEW

AND AT THE CLINIC VISIT

I HOME INTERVIEW

A. Individual and household demographic data

B. Knowledge and awareness of:

1. High blood pressure
2. Cholesterol
3. Dietary factors (fat, salt)
4. Heart disease and stroke

C. Health Behaviours:

1. Smoking
2. Alcohol consumption
3. Physical activity
4. Compliance with prescribed treatment for high blood pressure and elevated blood cholesterol

D. Two blood pressure measurements

II CLINIC VISIT

A. Two blood pressure measurements

B. Height and weight

C. Fasting blood sample

TABLE 2

NUMBER IN THE POPULATION, SAMPLE

DRAWN FROM FILE AND RESPONSE BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Number in population [a]	103400	114900	22200	103000	116800	26900	487200
Number drawn from file [b]	1279	501	252	1117	477	246	3872
Number located [c]	795	384	214	747	397	205	2742
Home interview completed							
No.	564	314	162	583	319	156	2098
%[d]	71	82	76	78	80	76	77
Home interview and clinic visit completed							
No.	505	297	154	539	310	148	1953
%[e]	64	77	72	72	78	72	71

[a] Postcensal annual estimates of population, June 1, 1988. Statistics Canada (Cat. No. 91-210).

[b] Total number of names drawn from the NB Medicare data files.

[c] Total number of individuals who were located using information from the NB Medicare data files and were invited to participate in the NBHHS.

[d] Percentage who completed the home interview among those located.

[e] Percentage who completed the home interview and clinic among those located.

TABLE 3

NUMBER LOCATED AND

RESPONSE BY COUNTY

County	Located	Home Interview Completed		Home Interview and Clinic Completed	
	Number	Number	%	Number	%
Stratum I (a)					
Dalhousie & Campbellton	81	70	86	67	83
Chatham & Newcastle	80	76	95	70	88
Bathurst	79	70	89	63	80
Moncton	365	283	78	273	75
Saint John	557	360	65	338	61
Fredericton	195	126	65	115	59
Edmundston	82	73	89	72	88
Stratum II (b)					
Madawaska Co.	88	74	84	73	83
Restigoouche Co.	84	71	85	65	77
Gloucester Co.	118	107	91	82	69
Stratum III (c)					
Victoria Co.	83	75	90	72	87
Northumberland Co.	77	65	84	62	81
Carleton Co.	78	73	94	71	91
York Co.	104	72	69	68	65
Sunbury Co.	91	63	69	57	63
Queens Co.	74	47	64	35	47
Charlotte Co.	92	72	78	65	71
Kings Co.	116	79	68	78	67
Saint John Co.	22	17	77	14	64
Albert Co.	96	66	69	61	64
Westmorland Co.	94	87	93	81	86
Kent Co.	86	72	84	71	83
Total	2742	2098	77	1953	71

(a) Urban centres as per census of Canada definition.
(b) Areas in the rural part of northern counties (excluding urban centres)
(c) Areas in the rural part of southern counties (excluding urban centres).

TABLE 4

SOCIODEMOGRAPHIC CHARACTERISTICS OF

PARTICIPANTS IN THE HOME INTERVIEW (a) (b)

	Percent %
Education: (c)	
Elementary	7
Secondary	63
Post Secondary	30
Total	100
Employment Status:	
Full time	47
Part time	11
Unemployed/laid off	8
Retired	12
Homemaker	16
Student	4
Other	2
Total	100

(a) Unweighted data.

(b) Total No. in the sample: 2097.

(c) Education: elementary = grades 0 - 6
secondary = grades 7 - 12
post secondary = grades >12

TABLE 5

MEAN VALUES OF BLOOD PRESSURE [a]

AND PREVALENCE OF HIGH BLOOD PRESSURE [b]

BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Systolic B.P. Mean (mmHg)	125	130	140	113	125	143	-
Diastolic B.P. Mean (mmHg)	79	82	80	72	79	77	-
Prevalence of HBP %	11	30	28	3	22	41	19

(a) Based on the mean of four blood pressure (B.P.) measurements obtained at two separate visits.

(b) High Blood Pressure (HBP) is defined as diastolic B.P. $\geq$90 mmHg and/or on treatment (pharmacological or non-pharmacological: weight control and/or salt restriction).

TABLE 6

PREVALENCE OF HIGH BLOOD PRESSURE AWARENESS TREATMENT AND CONTROL STATUS (a) (ALL AGE AND SEX GROUPS COMBINED)

Status	Prevalence %
Aware	
Treated and controlled (b)	41
Treated and not controlled (c)	26
Not treated and not controlled (d)	12
Not aware (e)	21
Total (f)	100

(a) The group of individuals distributed across the categories in the table have either been told that they have HBP or were found to have HBP (DBP $\geq$90 mm Hg) on measurement; excluded are those who were told that they had HBP but were not on treatment and had DBP <90 mmHg.

(b) Individuals who were told that they had HBP and were treated and have DBP <90 mmHg.

(c) Ditto as (b) with DBP $\geq$90 mmHg.

(d) Individuals who were told that they had HBP and were not treated and have DBP $\geq$90 mmHg.

(e) Individuals who were never told they had HBP and have DBP $\geq$90 mmHg.

(f) Total No. in the sample: 374.

TABLE 7

PERCENT RESPONSES TO QUESTIONS ON BLOOD PRESSURE MEASUREMENT BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Ever had B.P. checked	93	99	100	99	100	100	98
Had B.P. checked within last year (a)	56	68	80	75	77	89	71
B.P. was checked: (a)							
by doctor	45	56	63	54	56	55	54
by nurse	43	39	35	40	35	41	39
Actual value of B.P. measurement provided (a)	29	27	22	29	35	32	30

(a) Among those individuals who reported having their B.P. ever checked (Total No. in the sample: 2054).

TABLE 8

PERCENT RESPONSES TO QUESTIONS

ON TREATMENT FOR HIGH BLOOD PRESSURE

(ALL AGE AND SEX GROUPS COMBINED)

	Percent %
Ever told by health professional that they have HBP	26
Any treatment or program prescribed (a)	64
Currently not following a treatment or program (b)	31
Currently taking drugs (b)	51

(a) Among those individuals who were ever told that they had HBP (Total No. in the sample: 526).

(b) Among those individuals who were ever told that they had HBP and for whom something was prescribed (Total No. in the sample: 340).

TABLE 9

SPECIFIC ADVICE GIVEN TO THOSE WITH HIGH BLOOD PRESSURE FOR WHOM TREATMENT OR PROGRAM WAS PRESCRIBED (a) (b) (c)

(ALL AGE AND SEX GROUPS COMBINED)

Advice	Percent %
Take drugs only	33
Drugs and other treatment	45
Salt free diet	39
Watch the weight	29
Avoid stress	12
Start exercise program	11
Cut down on alcohol	2

(a) Total No. in the sample: 327.

(b) Excluding responses 'to cut down or stop smoking' and the residual category 'other'.

(c) Unprompted responses, more than one response allowed.

TABLE 10

PERCENT AWARE OF DIETARY FACTORS RELATED

TO HIGH BLOOD PRESSURE (a) (b)

(ALL AGE AND SEX GROUPS COMBINED)

Factor	Percent %
Alcohol	64
Salt/salty foods	55
Fats	41
Cholesterol	27
Fried foods	24
Sugar/sweet foods	17
Coffee/caffeine	16
Pork	7
Meats generally	6
Specific meat other than pork	6
Eating too much	4
Saturated fats	3
Sodium	2

(a) Among those who said that HBP is related to what people eat or drink (Total No. in the sample: 1784).

(b) Unprompted responses, more than one response allowed.

TABLE 11

MEAN VALUES FOR TOTAL PLASMA CHOLESTEROL AND HDL CHOLESTEROL BY AGE AND SEX (a)

		Male			Female		
		18-34	35-64	65-74	18-34	35-64	65-74
Total Plasma Cholesterol							
Mean	mmol/L	4.8	5.6	5.6	4.7	5.4	5.9
	[mg/dL]	[186]	[218]	[215]	[181]	[208]	[230]
HDL - Cholesterol							
Mean	mmol/L	1.2	1.2	1.1	1.4	1.4	1.3
	[mg/dL]	[47]	[46]	[44]	[53]	[56]	[52]
(Number in the sample)		(474)	(285)	(148)	(499)	(298)	(139)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 12

MEAN VALUES FOR LDL CHOLESTEROL AND TRIGLYCERIDES BY AGE AND SEX (a)

		Male			Female		
		18-34	35-64	65-74	18-34	35-64	65-74
LDL - Cholesterol							
Mean	mmol/L	2.9	3.5	3.6	2.7	3.2	3.7
	[mg/dL]	[112]	[136]	[139]	[106]	[125]	[145]
(Number in the sample)		(462)	(270)	(142)	(494)	(297)	(136)
Triglycerides							
Mean	mmol/L	1.6	2.3	1.8	1.3	1.6	1.9
	[mg/dL]	[139]	[202]	[164]	[113]	[138]	[170]
(Number in the sample)		(474)	(285)	(148)	(499)	(298)	(139)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 13

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY TOTAL PLASMA CHOLESTEROL LEVELS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<5.2 mmol/L (<200 mg/dL)	68	34	28	76	52	23	53
5.2-6.2 mmol/L (200-239 mg/dL)	24	38	49	17	25	39	29
≥6.2 mmol/L (≥240 mg/dL)	8	28	23	7	23	38	18
Total	100	100	100	100	100	100	100
(Number in the sample)	(474)	(285)	(148)	(499)	(298)	(139)	(1843)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 14

PERCENT DISTRIBUTION OF INDIVIDUALS [a]

BY LDL CHOLESTEROL LEVELS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<3.4 mmol/L (<130 mg/dL)	75	45	39	81	62	32	62
3.4-4.1 mmol/L (130-159 mg/dL)	20	30	33	13	21	38	23
4.1-4.9 mmol/L (160-189 mg/dL)	4	19	25	5	13	14	11
≥4.9 mmol/L (≥190 mg/dL)	1	6	3	1	4	16	4
Total	100	100	100	100	100	100	100
(Number in the sample)	(462)	(270)	(142)	(494)	(297)	(136)	(1801)

[a] Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 15

PERCENT DISTRIBUTION OF INDIVIDUALS [a]

BY HDL CHOLESTEROL LEVELS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<0.9 mmol/L (<35 mg/dL)	9	13	26	3	4	5	8
≥0.9 mmol/L (≥35 mg/dL)	91	87	74	97	96	95	92
Total	100	100	100	100	100	100	100
(Number in the sample)	(474)	(285)	(148)	(499)	(298)	(139)	(1843)

[a] Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 16

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY HDL CHOLESTEROL AND LDL CHOLESTEROL LEVELS

(ALL AGE AND SEX GROUPS COMBINED)

	HDL Cholesterol		Total
	<0.9 mmol/L (<35 mg/dL)	≥0.9 mmol/L (≥35 mg/dL)	
LDL Cholesterol			
<3.4 mmol/L (<130 mg/dL)	5	57	62
3.4-4.1 mmol/L (130-159 mg/dL)	2	21	23
4.1-4.9 mmol/L (160-189 mg/dL)	1	10	11
≥4.9 mmol/L (≥190 mg/dL)	0	4	4
Total	8	92	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more (Total No. in the sample: 1801).

TABLE 17

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY TOTAL PLASMA CHOLESTEROL AND LDL CHOLESTEROL LEVELS

(ALL AGE AND SEX GROUPS COMBINED)

	Total Plasma Cholesterol			Total
	<5.2 mmol/L (<200 mg/dL)	5.2-6.2 mmol/L (200-239 mg/dL)	≥6.2 mmol/L (≥240 mg/dL)	
LDL Cholesterol				
<3.4 mmol/L (<130 mg/dL)	53	9	0	62
3.4-4.1 mmol/L (130-159 mg/dL)	2	17	4	23
4.1-4.9 mmol/L (160-189 mg/dL)	0	2	9	11
≥4.9 mmol/L (≥190 mg/dL)	0	0	4	4
Total	55	28	17	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more (Total No. in the sample: 1801).

TABLE 18

PERCENT DISTRIBUTION OF INDIVIDUALS (*)

BY TOTAL PLASMA CHOLESTEROL AND HDL CHOLESTEROL LEVELS

(ALL AGE AND SEX GROUPS COMBINED)

	Total Plasma Cholesterol			Total
	<5.2 mmol/L (<200 mg/dL)	5.2-6.2 mmol/L (200-239 mg/dL)	≥6.2 mmol/L (≥240 mg/dL)	
HDL Cholesterol				
<0.9 mmol/L (<35 mg/dL)	3	4	1	8
≥0.9 mmol/L (≥35 mg/dL)	50	25	17	92
Total	53	29	18	100

(*) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more (Total No. in the sample: 1843).

TABLE 19

PERCENT RESPONSES TO QUESTIONS

ON CHOLESTEROL MEASUREMENT

(ALL AGE AND SEX GROUPS COMBINED)

	Percent %
Ever heard about cholesterol	95
Ever had blood cholesterol measured (a)	34
Was told what blood cholesterol level was (b)	40
Ever told by health professional that blood cholesterol was high (a)	11
Any treatment prescribed or advice given (c)	83
On diet to lower blood cholesterol (c)	42

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 1974).

(b) Among those who reported having had blood cholesterol measured (Total No. in the sample: 624).

(c) Among those who were ever told that blood cholesterol was elevated (Total No. in the sample: 197).

TABLE 20

PERCENT AWARE OF FACTORS RELATED TO

CHOLESTEROL IN FOODS

(ALL AGE AND SEX GROUPS COMBINED)

Factor	Percent %
Cholesterol is found in foods [a]	92
Cholesterol in foods affects health [b]	97
Cholesterol is found in: [c]	
Eggs	58
Pork	52
Beef	49
Whole milk	27
Cheese	23
Poultry	17
Seafood	8

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 1974).

(b) Among those who think cholesterol is found in food (Total No. in the sample: 1838).

(c) Unprompted responses, more than one response allowed.

TABLE 21

PERCENT AWARE OF FACTORS RELATED TO

CHOLESTEROL IN BLOOD

(ALL AGE AND SEX GROUPS COMBINED)

Factor	Percent %
Cholesterol is found in blood [a]	82
Blood cholesterol affects health [b]	99
Blood cholesterol affects health by: [c]	
Heart attack	66
Hardening the arteries	52
Increasing blood pressure	34
Stroke	24

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 1974).

(b) Among those reporting cholesterol is found in blood (Total No. in the sample: 1662).

(c) Unprompted responses, more than one response allowed.

TABLE 22

PERCENT RESPONSES TO QUESTION: "WHAT CAN A PERSON DO TO LOWER HIS/HER BLOOD CHOLESTEROL LEVEL" (a) (b)

(ALL AGE AND SEX GROUPS COMBINED)

Response	Percent %
Eat less fatty foods	55
Eat foods with less cholesterol	51
Exercise regularly	27
Use low fat dairy products	9
Lose weight	7
Take prescribed medication	7
Control stress and fatigue	3

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 1974).

(b) Unprompted responses, more than one response allowed.

TABLE 23

PERCENT AWARE OF HEALTH PROBLEMS RELATED

TO FAT CONSUMPTION

(ALL AGE AND SEX GROUPS COMBINED)

Problem	Percent %
Fat consumption affects health	91
Health problems related to fat consumption: (a) (b)	
Elevated blood cholesterol	47
Heart disease	45
Overweight	39
High blood pressure	26
Hardening of the arteries	20

(a) Among those who reported that fat consumption affects health (Total No. in the sample: 1853).

(b) Unprompted responses, more than one response allowed.

TABLE 24

PREVALENCE OF REGULAR CIGARETTE SMOKING (a) BY AGE AND SEX

		Male			Female			Total
		18-34	35-64	65-74	18-34	35-64	65-74	
Prevalence	%	40	30	21	34	26	13	31
Survey ofsmoking habits, 1986 (b)	%	36	37	30	36	29	16	33

(a) Regular cigarette smoking is defined as smoking at least one cigarette per day, every day.

(b) Smoking behaviour of Canadians, 1986. Department of National Health and Welfare, Ottawa 1988 (Cat. No. H39-66/9 1988E).

TABLE 25

PERCENT DISTRIBUTION OF NUMBER OF CIGARETTES SMOKED PER DAY AMONG REGULAR CIGARETTE SMOKERS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
1-10 cigs/day	12	10	13	15	10	42	12
11-25 cigs/day	78	66	70	77	73	47	73
26+ cigs/day	10	24	17	8	17	11	15
Total	100	100	100	100	100	100	100
(Number in the sample)	(228)	(88)	(32)	(201)	(88)	(19)	(656)

TABLE 26

PERCENT DISTRIBUTION OF ALCOHOL

CONSUMPTION BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
No alcohol in last year	6	23	30	17	25	52	21
<7 drinks/week	34	37	42	53	53	43	44
7-20 drinks/week	30	24	21	18	16	5	21
≥20 drinks/week	30	16	7	12	6	0	14
Total	100	100	100	100	100	100	100
(Number in the sample)	(563)	(311)	(160)	(582)	(319)	(156)	(2091)

TABLE 27

BODY MASS INDEX (a): MEAN VALUES AND PERCENT DISTRIBUTION BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
BMI Mean	25.2	26.8	26.7	24.6	26.6	27.5	26.0
Percent distribution of BMI:							
<20	7	4	1	19	8	3	9
20-25	46	34	38	44	38	31	40
25-27	19	19	18	12	13	16	15
≥27	28	43	43	25	41	50	36
Total	100	100	100	100	100	100	100
(Number in the sample)	(502)	(297)	(153)	(538)	(309)	(145)	(1944)

(a) BMI = weight(kg)/height^2(m) - calculated from clinic measurements.

TABLE 28

NUMBER AND PERCENTAGE OF INDIVIDUALS TRYING

TO LOSE WEIGHT BY LEVEL OF BMI BY AGE AND SEX

		Male			Female			Total
		18-34	35-64	65-74	18-34	35-64	65-74	
BMI (*)								
<25	%	4	5	4	27	30	7	17
(Number in the sample)		(267)	(102)	(56)	(343)	(145)	(47)	(960)
25-27	%	17	17	18	55	39	27	28
(Number in the sample)		(99)	(59)	(33)	(65)	(36)	(23)	(315)
≥27	%	33	31	42	63	51	46	43
(Number in the sample)		(136)	(136)	(63)	(130)	(128)	(75)	(668)

(*) BMI = weight(kg)/height^2(m) - calculated from clinic measurements.

TABLE 29

PERCENT RESPONSES TO QUESTIONS RELATED TO

TRYING TO LOSE WEIGHT BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Presently trying to lose weight	15	18	23	39	40	29	28
Trying to lose weight by: (a) (b)							
Dieting	81	87	85	76	90	96	85
Exercise	70	57	66	67	46	43	57
Skipping meals	14	9	1	18	12	2	13
Weight control programs	0	4	0	10	13	4	8
Diet pills	0	3	0	1	0	0	1
(Number in the sample)	(83)	(66)	(32)	(230)	(127)	(49)	(587)

(a) Among those trying to lose weight.

(b) Unprompted responses, more than one response allowed.

TABLE 30

PREVALENCE OF AWARENESS (a) OF DIABETES

	Percent %
Percent Aware (b)	5

(a) Awareness is defined as ever being told that you have diabetes.

(b) Among the participants who were aware, 23 were diagnosed at age $\leq$30 years, 76 at age >30 years and 2 were unsure of age at diagnosis.

TABLE 31

PERCENT ENGAGING IN PHYSICAL ACTIVITY

BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Exercise regularly (at least once per week)	56	51	62	67	51	40	55
Most of the exercise is strenuous (a) (b)	63	36	21	37	24	16	38
Length of exercise session is over 30 minutes (a)	78	61	38	50	48	33	57

(a) Among those who reported exercising regularly (Total No. in the sample: 1207).

(b) "Strenuous" is defined as enough exercise to cause sweating or breathing heavily

TABLE 32

PERCENT DISTRIBUTION OF INDIVIDUALS WITH 0, 1, 2, 3

MAJOR RISK FACTORS (a) BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
0 risk factors	49	17	15	52	34	10	32
1 risk factor	42	47	54	37	42	50	43
2 risk factors	15	30	27	11	20	36	21
3 risk factors	3	6	4	0	4	4	4
Total	100	100	100	100	100	100	100
(Number in the sample)	(474)	(285)	(147)	(499)	(298)	(139)	(1842)

(a) Risk factors defined as follows:

Elevated total plasma cholesterol: $\geq$5.2 mmol/L (200 mg/dL).
High blood pressure: DBP $\geq$90 mmHg and/or on treatment.
Regular cigarette smoking.

TABLE 33

PERCENT AWARENESS OF CAUSES OF HEART DISEASE (a)

(ALL AGE AND SEX GROUPS COMBINED)

Cause reported	Percent %
Smoking	41
Excess stress	38
Overweight	35
Poor diet	33
Lack of exercise	31
High blood cholesterol	30
High blood pressure	29
Heredity	20
Overwork	18
Excess fats	15
Excess salt	8
Foods with high cholesterol	7
Hardening of the arteries	6

(a) Unprompted responses, more than one response allowed.

TABLE 34

PERCENT OF PARTICIPANTS WITH DIFFERENT CHARACTERISTICS AMONG THOSE WHO COMPLETED THE QUESTIONNAIRE ONLY, OR COMPLETED THE QUESTIONNAIRE AND ATTENDED THE CLINIC [a]

Characteristic	Completed the Questionnaire only [b] %	Attended the Clinic [c] %
High Blood Pressure	15	18
Regular Cigarette Smoker	45	30
Sedentary lifestyle [d]	44	42
Post-secondary education	18	31
Income over $25,000 per annum	50	54

(a) Unweighted data.

(b) Number in the sample: 145

(c) Number in the sample: 1952

(d) Exercise less than once per week.

APPENDIX I: METHODOLOGY

Population

The target population for the survey was the non-institutionalized, adult population of New Brunswick (ages 18 to 74), with the exclusion of those living on Indian reserves, institutions (e.g.: prisons, hospitals) and military camps. The province of New Brunswick has a total population of 714,000 of which 487,200 are 18 to 74 years of age (Statistics Canada, 1988). About one-third of the population consider French as their first language. The unemployment rate in New Brunswick is higher than the national average and it is subject to seasonal fluctuations. The economy of the province consists of mining, tourism, forestry, energy, fishing, agriculture and other related industries.

Sampling frame

The sampling frame was the computerized list of residents of the province enrolled in the Medicare Registration File. Medicare is universally available in the province and practically all residents are registered with Medicare. The Medicare Registration File was established with the introduction of universal medicare in the province. Each individual record has a unique identifier with name, age, sex and address. Individuals born in the province are enrolled in medicare at birth.

Sample selection

The province has 15 counties, three of which are located in what is known as the northern region of the province. There are seven urban centers as defined by Statistics Canada. For the purposes of the sampling design, the province was divided into three strata. Stratum I was made up of the seven urban centers and Stratum II consisted of the three northern counties. Stratum III was formed with the remaining twelve primarily rural, southern counties.

All urban centers in stratum I and all counties in strata II and III were represented in the sample. To select individuals within these areas, all individuals in the Medicare Registration File were stratified into six age and sex strata. From each stratum, a systematic random sample was selected using random starts and appropriate sampling ratios. The latter were chosen so as to obtain the expected number participants required in each selected area.

The target sample size was 2,000 individuals. To accommodate failure-to-locate and non-response, a total sample of 3,872 individuals in the age-sex groups and areas required was drawn from the Medicare Registration File. Of these 2,742 were located and invited to participate in the survey.

The larger sample allocation for the younger age groups (Table 2) was to obtain an even distribution of individuals expected to fall into the high risk group categories (e.g.: high blood pressure and elevated blood cholesterol) among age-sex groups. This pattern of allocation tends to yield higher precision for the prevalence estimates in the younger age groups which might constitute a priority for intervention.

Staff training

Interviewing training sessions were carried out for the public health nurses in English and French by staff from Statistics Canada. Training was also provided on blood pressure measurements, measurement of height, weight and drawing of blood samples. An interviewer's manual, developed by Statistics Canada was used as a basis for training in administering the questionaire. Training sessions also covered matters related to survey data flow, quality control and all phases of data capture.

Blood pressure

The survey staff was trained for the measurement of blood pressure using a videotape developed by Dr. George Fodor, Faculty of Medicine, Memorial University of Newfoundland, following the Guidelines of the Canadian Coalition for High Blood Pressure (1988). Standardization for identification of the Korotkoff sounds was carried out using a tape and manual developed for the Hypertension Detection and Follow-up Program, School of Public Health, University of Texas. Standard mercury sphygmomanometers, 15-inches stethoscopes and appropriate size cuffs were used.

The subject rested quietly for a minimum of five minutes and had been asked not to eat or smoke for a minimum of thirty minutes prior to measurement. The participant's right arm was held at the level of the heart. The maximum inflation level was determined prior to the actual measurement of blood pressure. The first and fifth Korotkoff sounds were recorded for the systolic and diastolic pressures respectively. For sounds which continued to zero mm Hg the fourth Korotkoff sound was recorded. The pulse was also recorded.

Four blood pressure readings were taken at the beginning and end of the home interview, and at the beginning and end of the clinic visit. The blood pressure data presented in this report are based on the mean of these four measurements.

Height and weight

Weight was measured using a clinic scale. Participants were dressed in normal indoor clothing without shoes. Height was measured against a wall, using a walled tape measure, with participants standing without shoes on a hard surface. For purposes of this report the height and weight data were converted to Body Mass Index values [weight(kg)/height(m) squared] at the Atlantic Heart Health Data Processing Centre.

Blood samples

Participants had been asked to fast for twelve hours. At the clinic, the time actually fasted was recorded. A venous blood sample was obtained in 15 ml Lavender stopper Vacutainer tube containing sodium EDTA. The filled tube was promptly mixed by inverting it eight times. The tube was labelled and stored at 4 degrees C pending centrifugation which was done within four hours of the taking of the blood specimen. The plasma was transferred to Bijou bottles by Pasteur pipettes and shipped on ice packs for lipid analysis at the Core Lipid Laboratory at the University of Toronto. This Laboratory is standardized to the Lipid Research Clinics methodology.

The lipid fractions determined were: total plasma cholesterol, triglycerides, high density lipoprotein (HDL) cholesterol, and low density lipoprotein (LDL) cholesterol. Lipid determinations were made according to the Lipid Research Clinics Laboratory Manual and met the requirements for the standardization and quality control described elsewhere (National Heart, Lung and Blood Institute, 1974). The plasma samples were not examined for lipemia.

Quality control

The Regional Coordinators visited the clinics periodically to monitor adherence to survey procedures. For every fiftieth participant at the clinic, blood pressure and height and weight measurements were repeated by the coordinators to verify the information obtained by the survey staff. A duplicate blood sample was taken from every fiftieth participant to allow an independent quality control check of the analyses done at the Core Lipid Laboratory.

Ethical provisions

To ensure confidentiality, each participant was given a unique identifier, which precluded the need to have name and address on the survey instruments. A separate file was established to link name and address to the identifier for purposes of control of survey information and for referral to care services if necessary. Responsibility for the custody of this file and other survey information rests with the Principal Investigator, Department of Health and Community Services.

All participants were told of their blood pressure measurements. Those with diastolic blood pressure above 90 mm Hg were advised to see a doctor according to the Referral Guidelines of the Canadian Hypertension Society and of the Canadian Coalition for High Blood Pressure (Canadian Coalition for High Blood Pressure, 1988).

Each participant was sent a letter with the blood lipids results. Those with plasma cholesterol level above 5.2 mmol/L (200 mg/dL) were advised to see their physician.

The survey protocol was submitted and approved by the Ethical Review Committee of the Faculty of Medicine, Memorial University of Newfoundland.

Data processing

The home interview and the clinic data were edited by the regional coordinators and forwarded to the survey coordinator who verified the completeness of the data. The data were then sent to the Atlantic Heart Health Data Processing Centre at Memorial University. The Centre consolidated the information from the home interview, the clinic, including the results from the laboratory analyses, in a computerized master file.

To keep track of the interview and clinic data sets and to ensure completeness of data collection, control ledgers were independently kept by the regional coordinators and by the survey coordinators.

The Atlantic Heart Health Data Processing Centre checked all the data for inconsistencies and missing items. The inconsistencies were rectified and, whenever possible, the missing data were collected by recontacting the participants or by agreed-upon rules of imputation. Missing values for blood pressure were imputed using the mean of the available measurements for the participant. responses to knowledge and awareness questions were not imputed.

Probability weights, which are the inverse of the probabilities of inclusion of respondents in the sample, were calculated from the sample design and added to the computerized master file. Separate weights were used for information collected at the home interview and for information collected at the clinic. Non-response to the home interview or to the clinic was accommodated by adjusting the weights of the respondents. Unless otherwise stated, all the tabular estimates presented in this report are weighted.

APPENDIX II

PUBLIC HEALTH STAFF
NEW BRUNSWICK HEART HEALTH SURVEY 1988-1989

Principal Investigator: Dr. B. Christofer Balram
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Provincial Coordinator: Margaret Fox BN, RN

Administrative Staff:

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Dr. Vibart Shury	DMHO Region I
Dr. James Fan	DMHO Region II
Dr Jean-Louis Thibodeau	DMHO Regions IV and V
Dr Annette Séguin	DMHO Regions VI and VII
Lorraine Bourque	Senior Nursing Consultant
Beth Buchanan	Health Care Consultant
Alice Macintosh	Research Officer, Epidemiology

Regional Coordinators:

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Olive Keith, PHNS	Joan Gamble, PHNS
Valderez Deschenes, PHNS	Berthe Melanson, PHNS
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* District Medical Health Officer

** Public Health Nursing Supervisor

APPENDIX II (continued)

PUBLIC HEALTH STAFF
NEW BRUNSWICK HEART HEALTH SURVEY 1988-1989

Regional Staff:

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